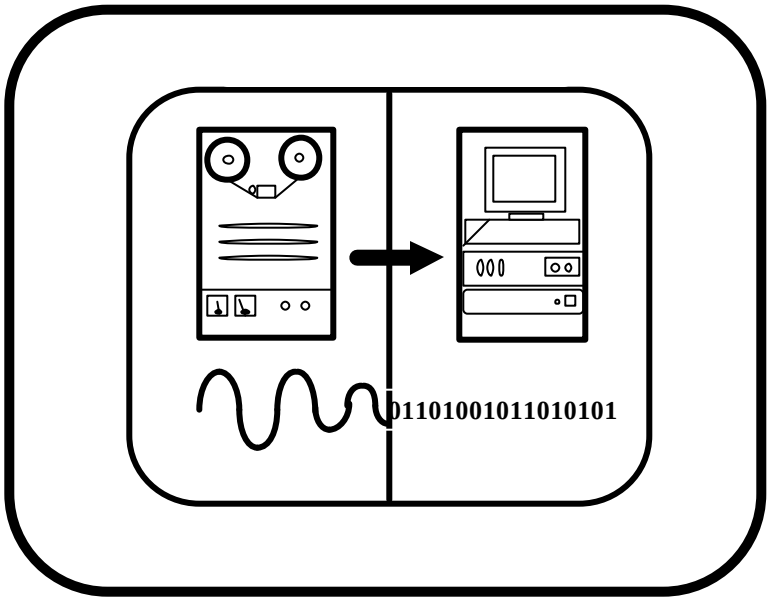


# Digital Voice Recording System Series 2

## (DVR2)

Technical Overview

**JULY 2002**

# Foreword

The Digital Voice Recording System Series 2 (DVR2) is a technically updated version of the computer based digital recording system distributed to field sites as the Digital Voice Recording System (DVRS) that replaced the old analog reel-to-reel voice recorders. As with the DVRS, the DVR2 long term storage medium is a 4mm digital audio tape (DAT) cartridge that can store up to 500 channel hours of voice communications on a single tape. The differences between DVRS and DVR2 are two mirrored hard drives with larger capacity (8GB vs. 1GB), larger input channel capacity, one DAT drive and updated software of the DVR2.

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# Digital Voice Recording System Series 2 (DVR2)

## 1. General

One of the responsibilities of the FAA, in support of the National Airspace System (NAS), is to provide dependable recording of all voice communications between air traffic controllers and pilots. The personal computer (PC) based Digital Voice Recording System Series 2 (DVR2) fulfills that requirement.

## 2. Baseline DVR2 Components

**2.1 DVR2 –** Digital Voice Recording System Series 2 can digitally record up to 432 channels of voice transmission. It consists of one Recorder workstation, and one or more DRUs, one Ethernet card, and one computer speaker system. Ancillary equipment delivered with the DVR2 are an un-interruptible power supply (UPS), and the remote alarm. Optional equipment include the remote reproducer (RR) and the global positioning satellite (GPS) antenna/receiver system.

**2.2 Recorder Workstation –** the recorder workstation is the brain of the entire DVR2. It is basically a computer with a keyboard, monitor and mouse. The workstation monitors and controls all interfaced DRUs via the DVR2 local area network.

**2.3 DAT –** Digital Audio Tape cartridge is the DVR2 recording storage medium. Each 120m cartridge, about the size of a credit card, can hold up to 500 channel hours of voice recording.

**2.4 DRU –** Digital Recorder Unit converts audio to a digital signal and records it onto two mirrored hard drives within the DRU. The unit also records the time code used for indexing and easy access of recordings. The DRU only records when audio is present using an activity detection system. Recorded audio will be archived onto a DAT cartridge for long term storage

## 3 Ancillary and Optional Equipment

**3.1 UPS –** the UN-interruptible Power Supply provides power to the DVR2 in the event of a power outage. It is rated to allow for 5 minutes of power until site backup power is initiated. There is an UPS in each rack.

**3.2 Remote Alarm –** an audible and visual alarm used to notify the operator of any recording malfunction.

**3.3 RR –** the Remote Reproducer is used to play back and re-record audio and time code from the DAT to a two-channel cassette. The RR is a "stand-alone" table-top unit.

**3.4 IRR –** the Integrated Reproducer is a smaller rack mounted version of the RR used at small (one DRU) sites that do not qualify for a full RR.

**3.5 GPS –** the Global Positioning Satellite (GPS) antenna/receiver system is an optional device provided to sites lacking a standard coded time source. The GPS receives its time code signal from a collection of Earth-circling satellites.

# 4. DVR2 Components Description

**4.1 Equipment Racks –** DVR2 with one or two DRUs is housed in one standard radio rack. A second rack can hold up to four additional DRUs. A single DRU can record up to 96 channels. The largest one-rack (two DRU) system can hold up to 192 channels. The largest two-rack DVR2 contains 432 channels. The GPS receiver, if required, is installed in the first rack.

**4.2 Remote Reproducer –** is a stand-alone workstation used to play back and re-record digital DAT information onto a built-in two-channel analog cassette recorder provided with the reproducer. A speaker system to allow for system monitoring and a time code display clock for observing the time of recording are also provided.

**4.3 Integrated Reproducer –** is a small rack-mounted, but functionally equivalent, version of the remote reproducer. It is delivered to one-DRU sites that do not receive a RR.

**4.4 Remote Alarm –** signals the operator of possible DVR2 malfunction. The unit is a desktop alarm box placed in a convenient location designated by local users. The unit can be located up to 500' from the recorder mainframe.

***4.5* Basic DVR2 –** A basic 24-channel DVR2, as delivered, is composed of the following: *X in CLIN column can be any number from 0 to 5 depending on buying period.*

| Nomenclature | Part number | CLIN | Quantity |
|---|---|---|---|
| 24-chan. system | 100908-001 | X903 | C1 sy. (w/20 DAT) |
| Integrated reproducer | 102910-101 | X004A | 1 ea. |
| Equipment rack | | X008H | 1 ea. |
| Remote alarm | | X008B | 1 ea. |
| DAT cleaning tape | 158001-002 | X007F | 2 ea. |
| Air filter | 260908-001 | X007G | 2 ea. |
| Media stock (DAT) | 158001-001 | X008J | 20ea |
| Optional items, if ordered, include: | | | |
| UPS | 259097-002 | X007CA | 1 ea. |
| GPS antenna/receiver | 259003-001 | X007B | 1 ea. |
| Remote reproducer | 102908-101 | X904AA | 1 sy. |

**Table 1. DVR2 Composition**

**4.6 Spares Kit –** is composed of equipment listed in the below table.

| Nomenclature | Part number | CLIN | Quantity |
|---|---|---|---|
| ADIF board | 259101-002 | X908P | 1 ea. |
| ALI board | 259111-002 | X908Q | 1 ea. |
| Mirroring Device | 258080-001 | X908AAS | 1 ea. |
| LAF board | 259113-002 | X008R | 1 ea. |
| APA-4 board | 259112-001 | X008S | 1 ea. |
| CPU board | 259361-001 | X008AAD | 1 ea. |
| Power Supply | 259101-002 | X008W | 1 ea. |
| DAT drive | 259230-001 | X008L | 1 ea. |
| SCSI card | 259362-001 | X008AAE | 1 ea. |

**Table 2. Typical Sites Spares Kit**

**5. DVR2 Basic System Configuration**

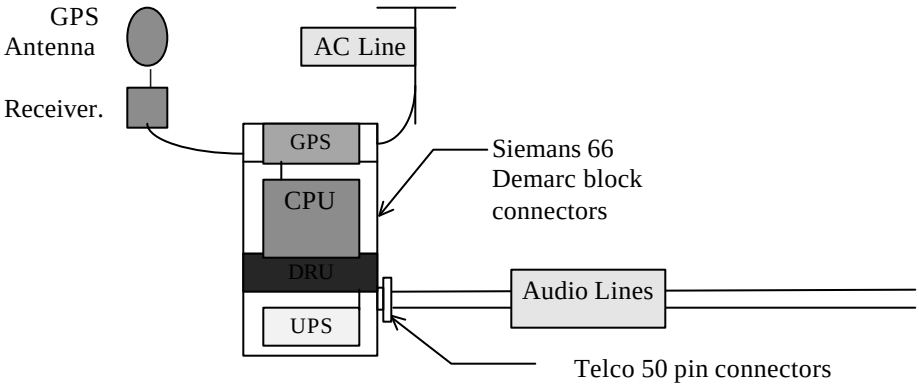



**Figure 1. DVR2 Basic Configuration**

## 6. Site Preparation Activities.

**6.1 Site Informational Call -** Contractor personnel will contact sites for specific information needed for DVR2 installation. A sample question might be how far is the GPS antenna is to be mounted from the rack

## 6.2 Site Preparation – The government is responsible for the following:

6.1.1 Identify and provide floor space for DVR2 equipment rack.
6.1.2 Install AC. power cables and audio lines to the DVR2 location
6.1.3 Provide an asbestos free floor space for drilling rack mounting holes
6.1.4 Provide bench space for sites that receive remote reproducers.
6.1.5 Locate installation site for the GPS antenna.
6.1.6 Identify cable path for GPS cable installation.

**6.3 Remote Reproducer Requirements -** The stand-alone remote reproducer unit requires a table or any flat surface at least 4' x 2' and a 110v AC outlet.

**6.4 HAZMAT–** If asbestos is present in the flooring, the site is responsible for drilling the necessary holes before arrival of the installation team.

## 7. DVR2 Installation and Training

**7.1 Schedule -** The equipment usually arrives on-site for inside delivery on the day prior to the scheduled installation. After equipment inventory and checkout by contractor personnel in the presence of the designated FAA regional technical officer's representative (TOR) the contractor installer will commence installation activities.

**7.2 Training –** Training for Airway Facilities (AF) personnel will normally be provided by resident training courses at the FAA Academy prior to equipment delivery. An on-site 12-hour operator course will be conducted for Air Traffic (AT) personnel by the contractor installer.

## 8. Cable Installation

**8.1 AC Power Cable –** composed of three wires (black, white, and green) for single phase 115 VAC is provided by the government from the power panel to the equipment rack location. The power cable enters through the top of the first DVR2 rack to connect to the junction box. Installer (Denro) will connect the power cables to the equipment rack. Before the installation can start **the power must be turned off.** If needed, each subsequent rack will connect to the initial junction box in the first rack for AC power.

**8.2 Siemens 66 Block –** Two sets of Siemans 66 blocks are provided. One set is initially used for parallel operation with existing equipment allowing for functional testing without disrupting current operation. The second set has pre-installed 600 Ohm terminations and at the time of cut-over the blocks are swapped for normal site operation. The cut-over consists of removing the input and output cables from the initial Siemans 66 block and connecting them to the 600 Ohm Siemans 66 block. No other connections or alterations are required.

**8.3 Remote Alarm Cable -** is installed by contractor installer using existing conduit, trays and ladders. This cable (up to a maximum length of 500') is routed to a location designated by local personnel.

**8.4 GPS Cable -** is installed by contractor installer from the GPS antenna through existing cable paths to the GPS receiver housed inside the DVR2 equipment rack.

## 9. Inspection and Cut-over

**9.1 Contractor Acceptance Inspection – (CAI)** takes place after completion of the functional test of the DVR2. All equipment is tested in accordance with government approved procedures to verify proper operation in the presence of the TOR The installer will correct all discrepancies before the Site Acceptance Form (FAA Form 256 or Department of Defense Form DD-250) is signed by both the contractor representative and the TOR.

**9.2 Operational Cut-over -** The final DVR2 installation step is to hold a joint acceptance inspection (JAI) and cut-over to the new equipment. After successful JAI the initial set of the Siemens 66 blocks is replaced the set with 600 Ohm terminations.

## 10. Optional Ethernet Connection to the Remote Reproducer

The remote reproducer and the recorder system are both based on a local ethernet network system making it easy for site personnel to link them, if desired. **This linkage is not included in the contract and must not to be installed prior to CAI**. Linking makes it possible for the operator at the reproducer station to get direct access to real-time recordings at the recorder. A direct patch audio cable can also be used to link the two stations if an ethernet connection is not desired. For assistance with remote access installation call AOS at 405-954-0531.

## 11. Engineering support

AOS 510 provides second level engineering support after CAI. The point of contact is Wes Boyd at 405-954-4435 or Jeremy Traylor at 405-954-9715.

# 12. Test Cables and Connections

The following test cables are used for performance verification of DVR2 equipment. Possible sources for the cables are included. If the cables are already on site new ones are not needed. Cable 1 is used to send tones into a miniature Bantam patch panel if installed. If the facility does not have a patch panel, Cable 2 is used instead to send tones into the 66 block. Cable 3 is used to receive tones from the audio output cable of the logger; it is constructed locally.

| Part | Manufacturer | Part Number | Description | Quantity |
|---|---|---|---|---|
| 1 Telco 310 male -Bantam male | Pomona www.pomonaelectronics.com | 4280 or 4280N | 60" Patch cable to send tones between Patch Panel (s) and test equipment. | 1 |
| 2 Telco 310 - Clip Leads | Pomona www.pomonaelectronics.com | 4812-J or 4812N-J | 60" Patch cable to send tones from test equipment into 66 block(s). | 1 |
| 3 RCA Phono Jack (Female)- Telco 310 Male | Constructed locally | | Wired RCA Female Sleeve to Telco 310 Ring using shield of RG59<br>Wired RCA Female Tip to Telco 310 Tip using center of RG59 | 1 |
| 3.1 Phono Plug Telco (WE) 310 | Switchcraft www.switchcraft.com | 482 | Connector used to construct test cable | 1 |
| 3.2 RCA Phono jack (female) | Switchcraft www.switchcraft.com | 3503 | Connector used to construct test cable | 1 |
| 3.3 Cable RG 59 | Belden www.belden.com | 9204 | used to construct test cable | Ask for price/foot quote |

# 13. MAINTENANCE TOOLS

The following tools will be needed for maintenance of the DVR2. Suggested sources have been included if the site does not already have the tools on hand. Tools that are used for the installation, maintenance and repair of Personal Computers have proved helpful in the maintenance of the DRU's and computer workstations.

| Part | Manufacturer | Part Number | Description | Quantity |
|---|---|---|---|---|
| Cassette Cleaning Cartridge | Any local source | N/A | Analog Audio Cassette | At least 1. |
| Transmission Test Set | Hewlett Packard<br>or<br>Northern Telecom | HP-4935A<br>or<br>TTS-44 | Audio Frequency | At least 1. |
| Screwdriver | Xcelite | CK20 | Set containing Flat Blade and #2 Phillips | 1 |
| Long Screwdriver | Xcelite | X1010 | #1 Phillips<br>Extra long shaft | 1 |
| Needle Nose pliers | Xcelite | LN775512 | 5-1/2" length<br>1-3/4" opening | 1 |
| Diagonal Cutters | Xcelite | 55CG | 5" length | 1 |

# 14. INSTALLATION ACCESSORIES

The following accessories may be added during installation of the DVR2.

| Part | Description | Quantity |
|---|---|---|
| 50 Pin Telco Cable (Male-Female) | From Denro 600 ohm terminated 66 blocks to FAA patch Panel | 1 for every 24 DVR2 input channels |
| Telex Patch Panel | Miniature Bantam Patch Panel between source equipment and 66 blocks. Convenient for injecting tones into recorder. | 1 for every 48 DVR2 input channels |
| Audio Bus Interconnection Parts | See page 3 | |
| Local Area Network (LAN) Interconnection Parts | See page 5 | |
| UPS | UPS for Reproducer matching the one provided with the recorder | 1 |

# 15. AUDIO BUS INTERCONNECTION PARTS

The following equipment is required to construct the audio bus between the reproducer and recorder stations. Possible sources are included. The audio bus should connected as described in the attached figure.

| Item | Part | Manufacturer | Part Number | Description | Quantity |
|---|---|---|---|---|---|
| 1 | Modular Jack-Jack Adapter | SPC Technology www.spctechnology.com | 8588-0215 or 52N9505 | 2 RJ-11 Jacks 6 position, 4 conductor | 1 logger 1<br>2-9 loggers 3 |
| 2 | Modular Plug | SPC Technology www.spctechnology.com | TA-24 or 46N5995 | RJ-11 Plug 6 position, 4 conductor | 1 logger 4<br>2-9 loggers 4n+6<br>n=# of loggers |
| 3 | Telephone Y Adapter | SPC Technology www.spctechnology.com | 8588-0166 or 52N9456 | RJ-11 2 jacks 1 plug 6 pos. 4 con. | 1 |
| 4 | 5 outlet modular tap | SPC Technology www.spctechnology.com | 8588-0191 or 52N9481 | 5 RJ-11 Jacks - 1 RJ-11 Plug 6 pos. 4 con. | 1 logger 0<br>2-5 loggers 2<br>6-9 loggers 4 |
| 5 | Modular Crimping Tool | SPC Technology www.spctechnology.com | 1763 or 92N3758 | Crimps 4,6 conductor RJ-11, RJ-12 and RJ-14 | 1 |
| 6 | Telephone Cable Plenum Rated | Black Box www.blackbox.com | EYN714A-1000 | 2 pair Category 3 Audio (twisted pair), used for interconnect between rep. and rec. | Ask for price/foot quote |
| 7 | Silver Satin Line Cord | Black Box www.blackbox.com | EL04A-1000 | 4 Wire Silver Satin base cord (bulk) | Ask for price/foot quote |

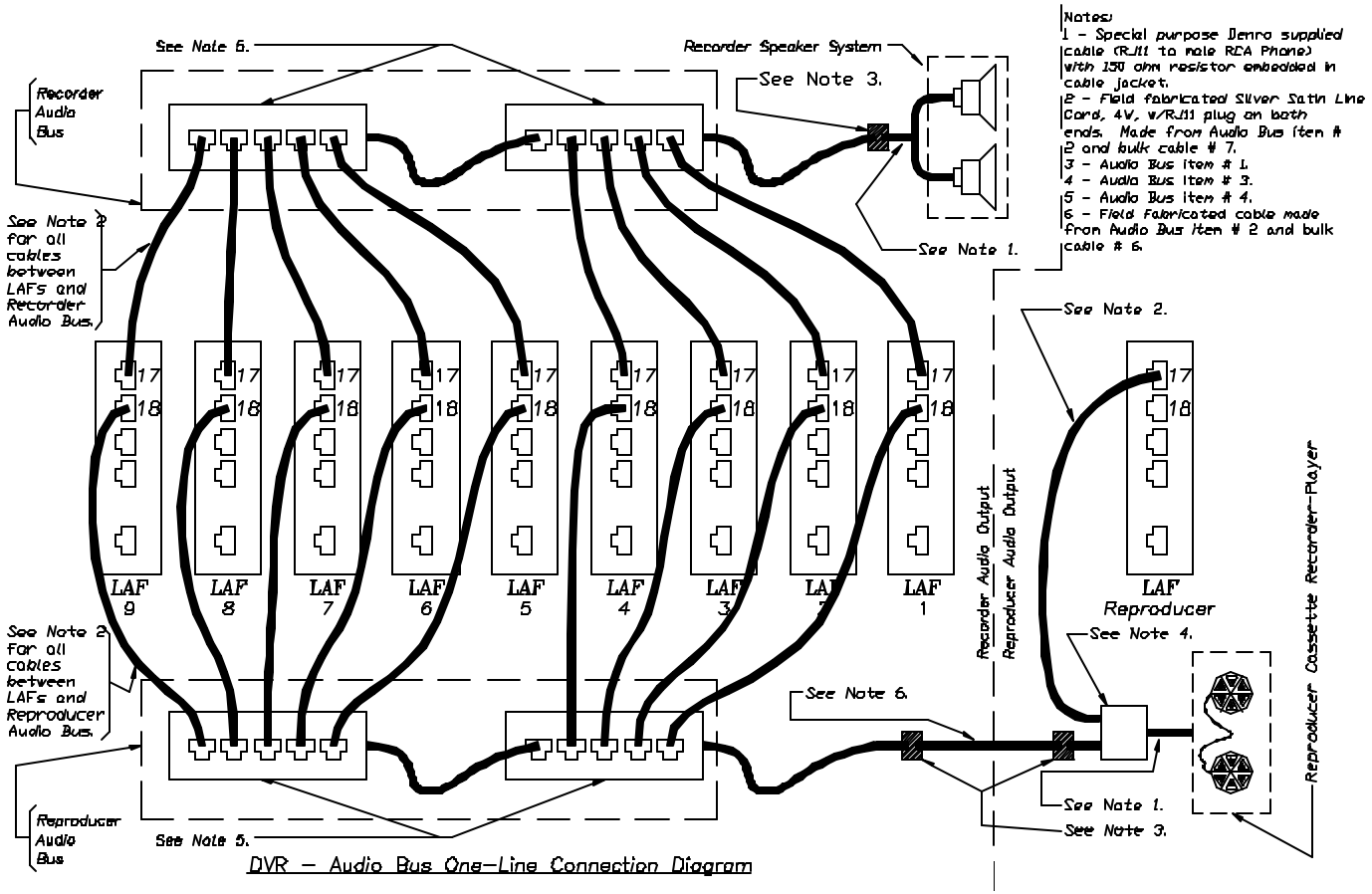

Notes:
1 - Special purpose Denro supplied cable (RJ11 to male RCA Phone) with 150 ohm resistor embedded in cable jacket.
2 - Field fabricated Silver Satin Line Cord, 4W, w/RJ11 plug on both ends. Made from Audio Bus Item # 2 and bulk cable # 7.
3 - Audio Bus Item # 1.
4 - Audio Bus Item # 3.
5 - Audio Bus Item # 4.
6 - Field fabricated cable made from Audio Bus Item # 2 and bulk cable # 6.
See Note 5.
Recorder Speaker System
See Note 3.
Recorder Audio Bus
See Note 2 for all cables between LAFs and Recorder Audio Bus.
See Note 1.
See Note 2.
17
18
LAF 9
LAF 8
LAF 7
LAF 6
LAF 5
LAF 4
LAF 3
LAF 2
LAF 1
LAF Reproducer
See Note 4.
Recorder Audio Output
Reproducer Audio Output
Reproducer Cassette Recorder-Player
See Note 2 for all cables between LAFs and Reproducer Audio Bus.
See Note 6.
Reproducer Audio Bus
See Note 5.
See Note 1.
See Note 3.
DVR - Audio Bus One-Line Connection Diagram

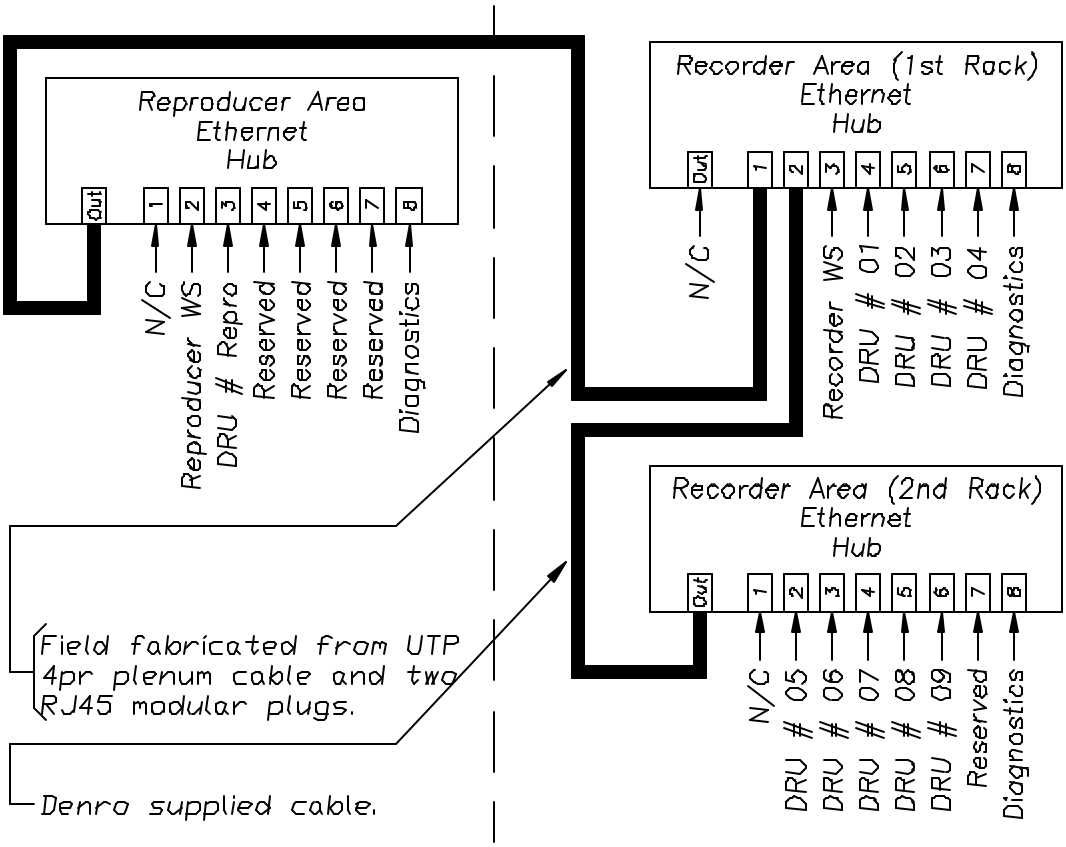
**Figure 1**

# 16. LOCAL AREA NETWORK (LAN) INTERCONNECTION PARTS

The following equipment is required to construct the LAN network interconnect between the recorder and reproducer stations. Possible sources are included if the materials needed are not on site.

| Part | Manufacturer | Part Number | Description | Quantity |
|---|---|---|---|---|
| Modular Plug (SPC Technology) | SPC Technology www.spctechnology.com | TA-31-8 | 8 conductor RJ-45 Non-keyed Plug | 2 |
| Modular Crimping Tool | Prestige Tools www.alliedelec.com | 24-7748 | Crimps 8 Pin Modular Plugs RJ-45 (TA-31) | 1 |
| LAN Cable Plenum | Black Box www.blackbox.com | EYN734A-1000 | 4 pair, Category 3 (10 MB/s LAN) | Ask for price/foot quote |

**NOTE**: The LAN cable between the Reproducer Area Hub and the first Recorder Area Hub cannot exceed 100 meters in length. There should be NO cross connects involved, and the cable should be a direct run with no other cable plant involved. If it is necessary to cross connect, each 66 block involved will shorten the 100 meter length by approximately 50 feet. If there is any change in wire gauge, or other discontinuities, these will also shorten the 100 meter limit as well.
**NOTE**: The LAN cables MUST be twisted pair cable of the type specified.




DVR – Local Area Network One-Line Connection Diagram

**Figure 2**

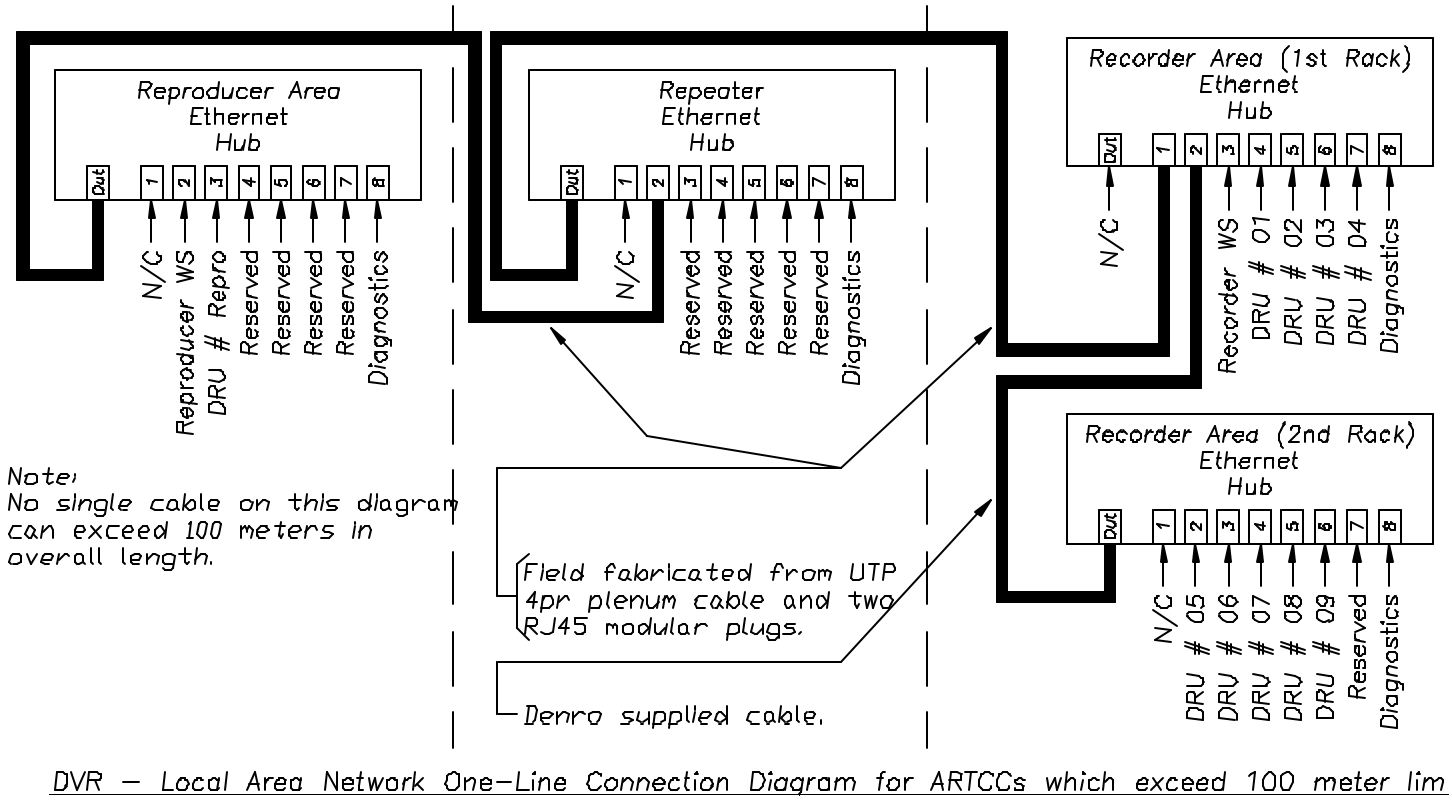



**Figure 3**

**NOTE:** This type of connection is to be used only in the ARTCC environment, where the cable length limit of 100 meters cannot be met. This type of connection can be used to extend the limit to 200 meters, for one time only. If the connection cannot be made within the constraints of this diagram, then contact AOS-510 with site specific information so that the appropriate solution can be provided.

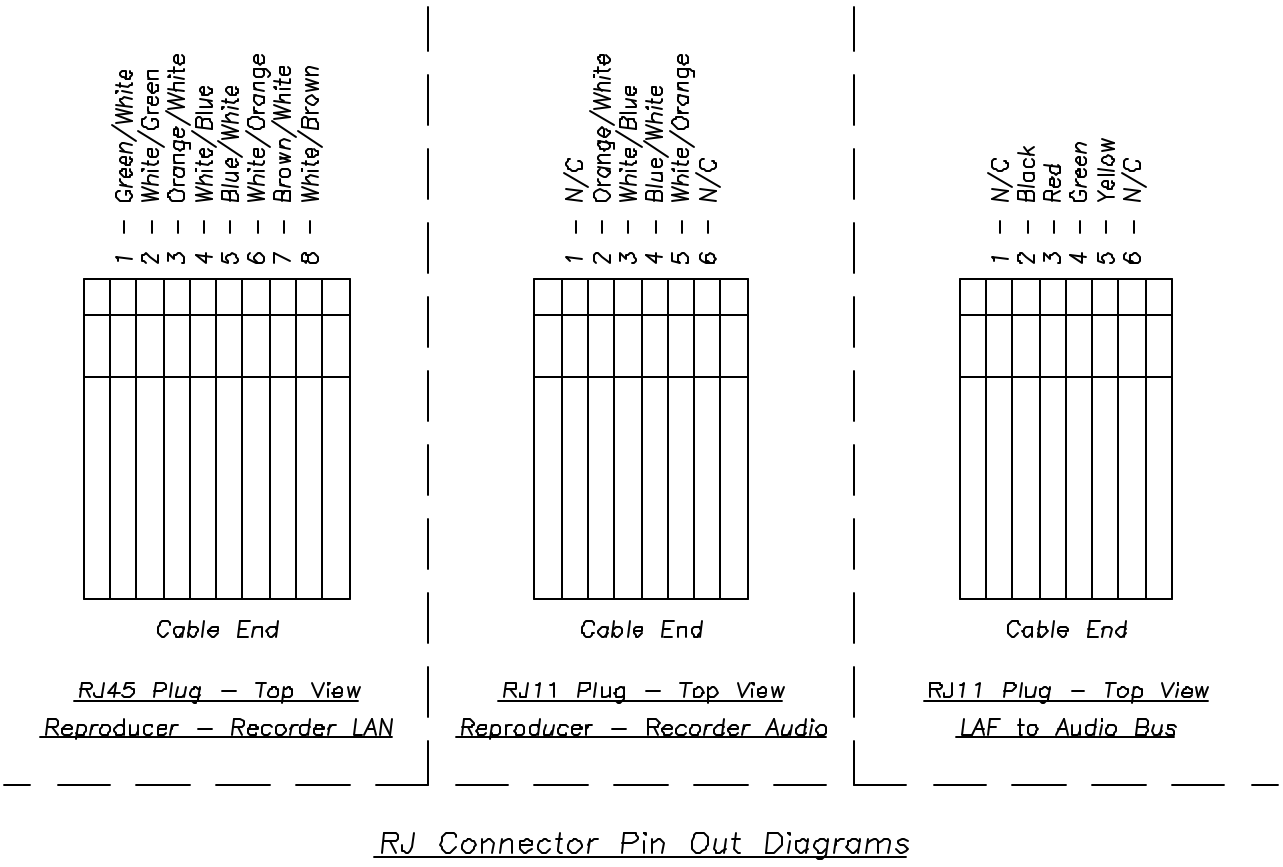



**Figure 4**

**NOTE:** This diagram is to be used for the construction of the FAA field fabricated cables.